

The University of New South Wales, Sydney, Australia

COMP9021 Principles of Programming

Session 1, 2012

Sample Final Exam, nonprogramming part

- Total number of questions: 12
- Total mark: 12
- The candidate may not bring calculators, laptops or written material (including books and notes)

Q1: On systems where 1 byte is allocated to a char, what is the internal representation of -5?

1. 10000101
2. 10000011
3. 11111101
4. 11111011

Answer: 4

Q2: On systems where floats are represented in single precision 32 bits, with the leftmost bit storing the sign, the 23 rightmost bits storing the decimal part, and the remaining 8 bits (in-between) storing the exponent, what is the internal representation of 1.125?

1. 00000000 00010000 00000000 00000000
2. 00000000 11111101 00000000 00000000
3. 00111111 10010000 00000000 00000000
4. 00111111 01111101 00000000 00000000

Answer: 3

Q3: Convert the expression

$$7 + (5 + (((1 + 2) + (3 + 4)) + 6))$$

into postfix notation. If a stack is used to evaluate the latter, show the successive contents of the stack after every push operation, till the expression is fully evaluated.

Answer:

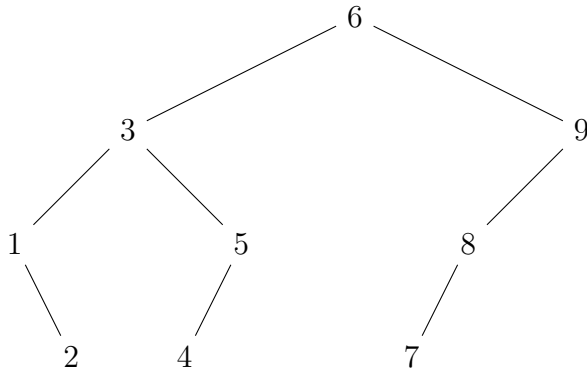
7 5 1 2 + 3 4 + + 6 + + +

							4						
					2		3	3	7		6		
			1	1	3	3	3	3	10	10	16		
		5	5	5	5	5	5	5	5	5	5	21	
7	7	7	7	7	7	7	7	7	7	7	7	7	28

Q4: Draw the binary search tree obtained from inserting the following keys, in the given order, into an initially empty tree:

6 3 5 9 1 4 2 8 7

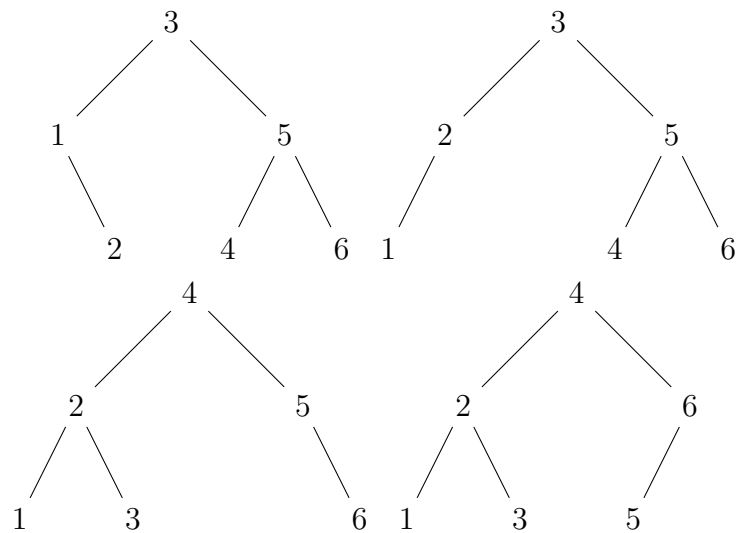
Answer:



Q5: Draw all binary search trees T such that

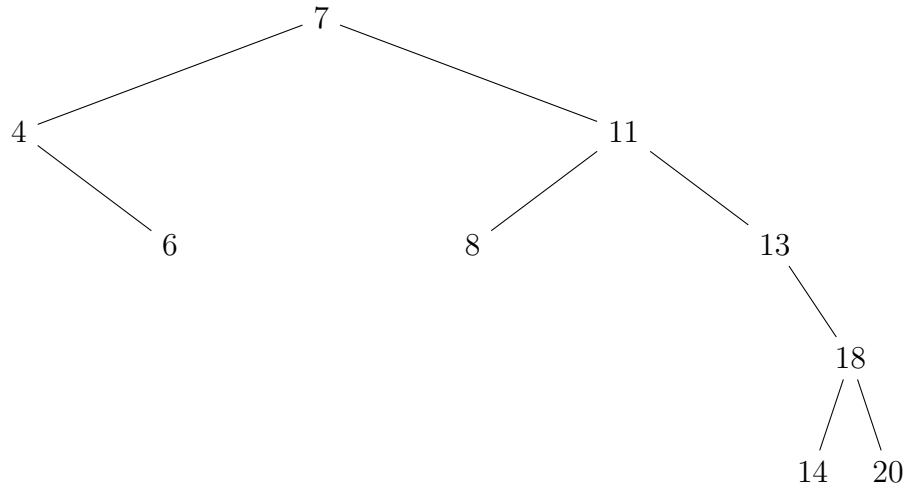
- the height of T is equal to 2, and
- the set of labels of all nodes in T is $\{1, 2, 3, 4, 5, 6\}$.

Answer:

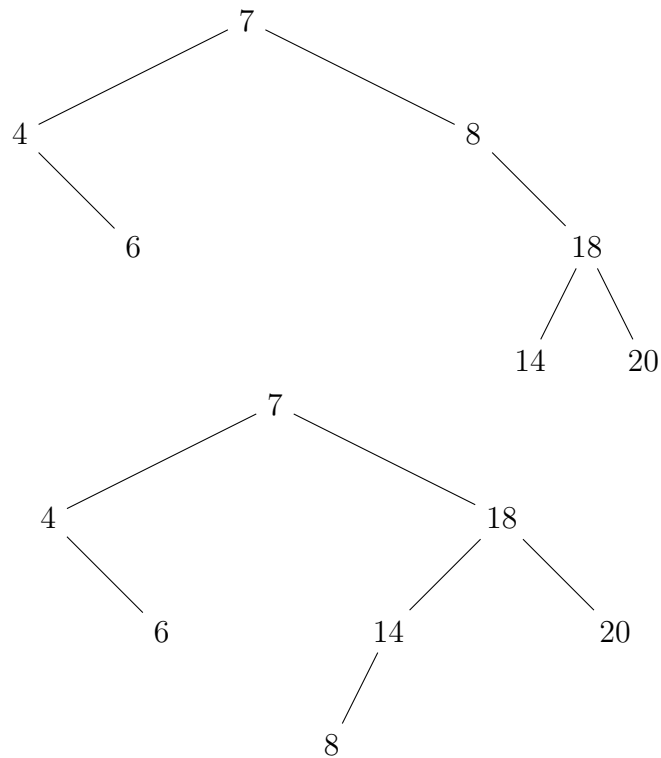


Q6: Draw all binary search trees that result from the following tree by deleting the node labeled 11 and then the node labeled 13.

Answer:



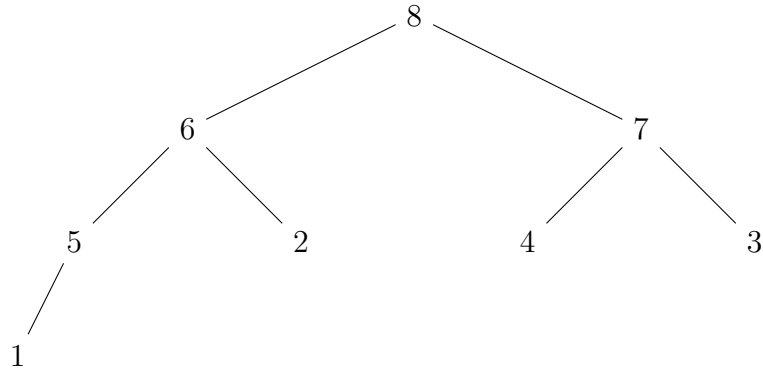
Answer:



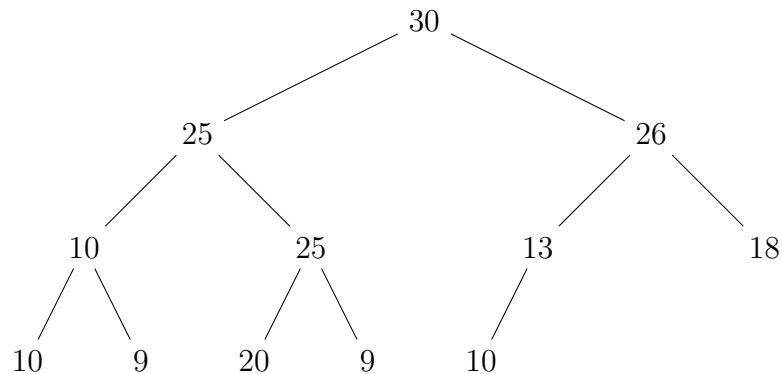
Q7: Draw the complete heap ordered binary tree that results from inserting in an initially empty tree, in the given order, the elements:

5 1 4 8 2 7 3 6

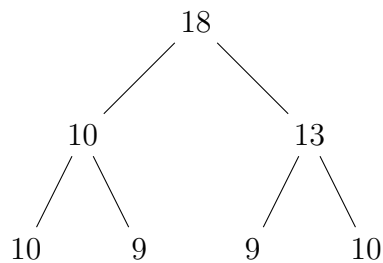
Answer:



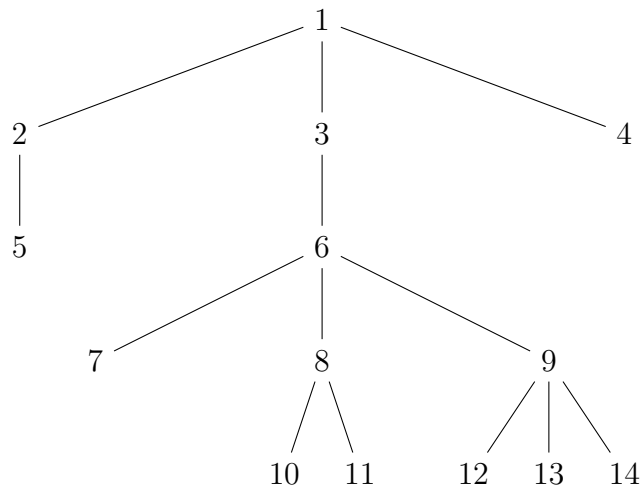
Q8: Draw the complete heap ordered binary tree obtained by deleting in sequence 5 elements (of highest priority) from the following complete heap ordered binary tree:



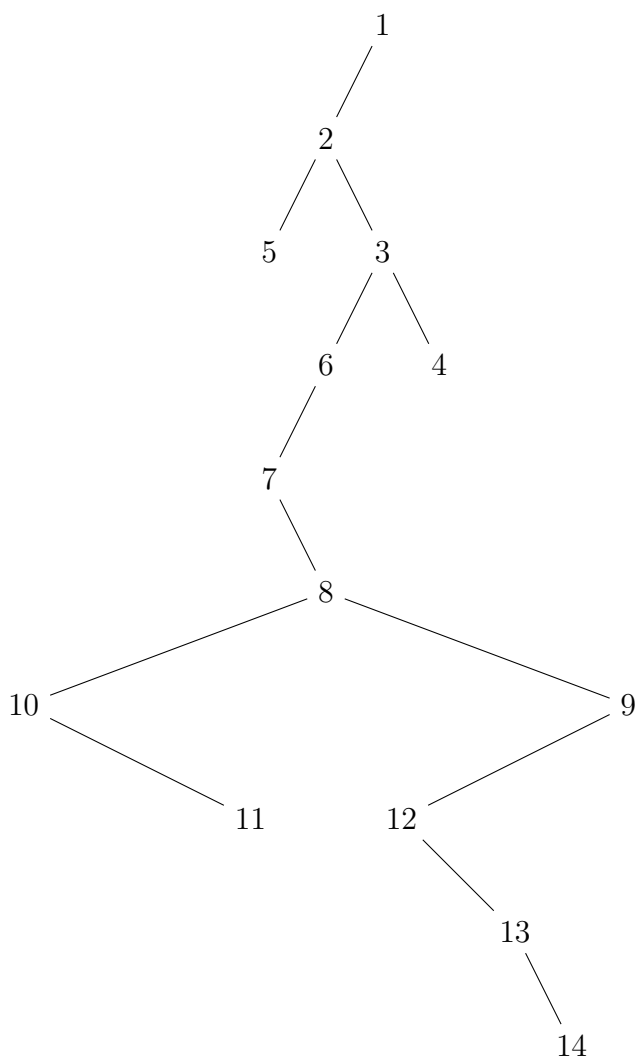
Answer:



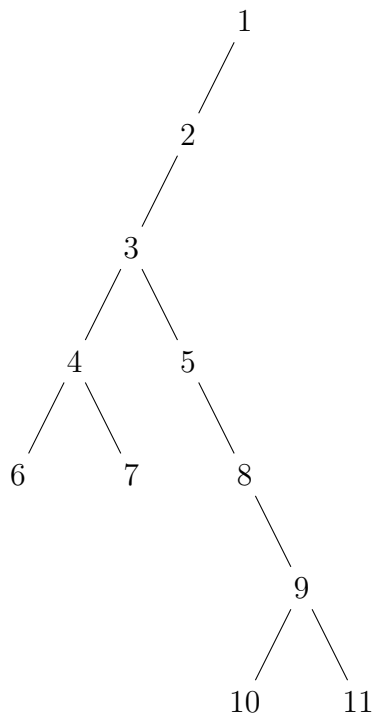
Q9: Give a leftmost-child-right-sibling pictorial representation of the following tree.



Answer:

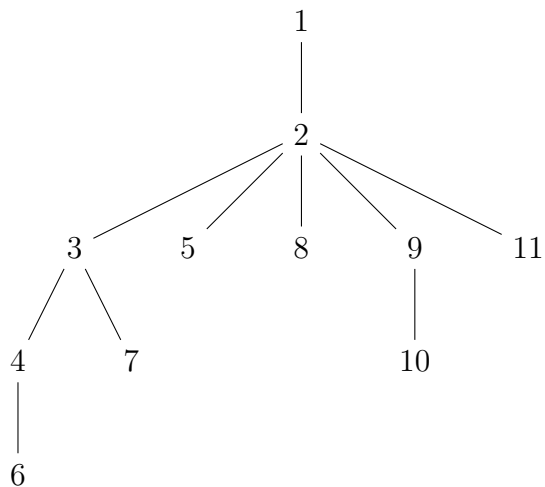


Q10: Consider the following binary tree T .



T is the leftmost-child-right-sibling tree representation of a tree T' . Draw T' .

Answer:

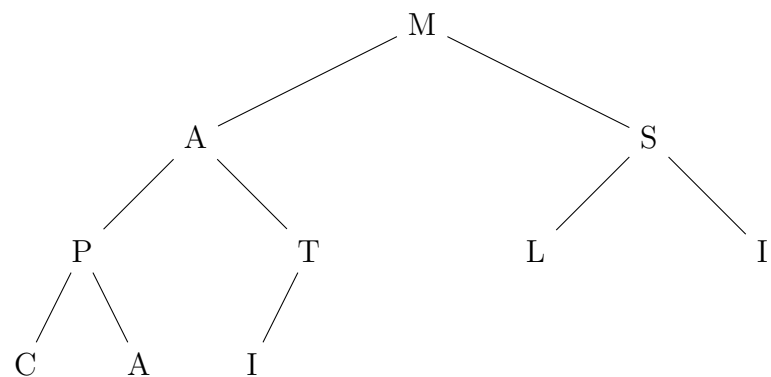
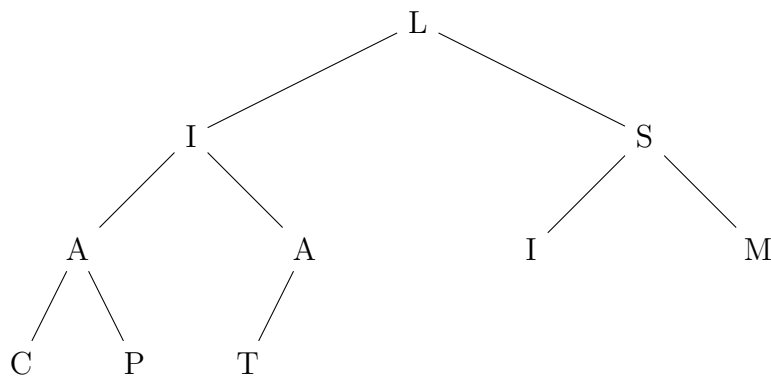
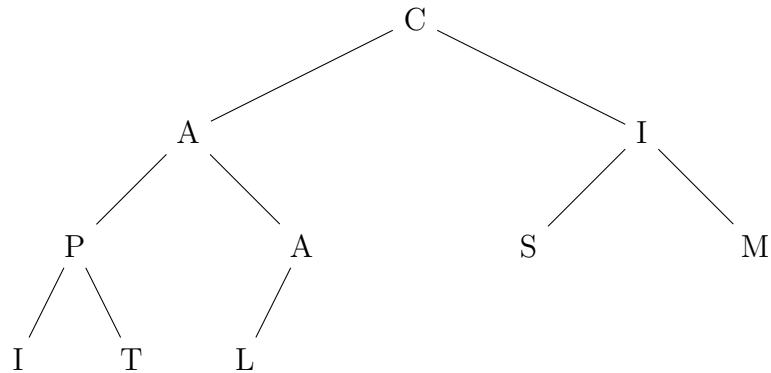


Q11: Draw a complete binary tree such that a preorder traversal of that tree yields the word CAPITALISM.

Draw a complete binary tree such that an inorder traversal of that tree yields the word CAPITALISM.

Draw a complete binary tree such that a postorder traversal of that tree yields the word CAPITALISM.

Answers, displayed in same order as the questions:



Q12: Consider the following list L of numbers:

7 6 3 2 1 4 5 8 9

Which lists are recursively sorted by `quicksort` when `quicksort` is called on L , with the leftmost element in a list used as the pivot?

Answer (displaying the actual structure of the recursive calls, assuming left sublists are sorted before right sublists):

(7 6 3 2 1 4 5 8 9)

(5 6 3 2 1 4)

(4 1 3 2)

(2 1 3)

(1)

(3)

()

(6)

(8 9)

()

(9)